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MacMillan, a companion of Peary on his latest expedition, is next year to head a scientific expedition upon the Greenland ice. Students of glaciology will watch with lively interest the developments in connection with all these expeditions, and let us hope that as a result our knowledge of continental ice masses will be greatly extended.

ANN ARBOR, Mich., May 9, 1911.

PROGRESSIVE DEVELOPMENT OF RESOURCES IN THE LAKE SUPERIOR REGION*

BY

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KEEWEENAW PENINSULA CANALS AND THE COPPER MINES. The Portage Lake ship canals (Fig. 1), built where the great transverse valley nearly bisects Keweenaw Peninsula also show a large traffic and a steady increase with the development of the mineral resources of the region, especially the copper.

YEAR.	BOUND UP. NET TONS.	BOUND DOWN. NET TONS.	TOTAL FREIGHT. NET TONS.	VALUA- TION.
1895.....	560,672	363,084	923,756	\$29,832,368
1900.....	1,190,527	677,245	1,867,772	57,380,129
1905.....	1,528,937	933,973	2,462,910	79,998,109
1907.....	1,728,673	767,663	2,496,336	101,919,661

The copper (presumed to be chiefly not ore but the refined product) makes up only three-tenths of one per cent. of the tonnage shipped in 1907 (85,279 tons), though its value (\$39,228,340 in 1907) was over 38 per cent. of the tonnage. Other goods valued at \$101,919,661 were carried through the Portage Lake canals in 1907.

DECREASE OF LUMBER SHIPMENTS. Another product which is carried over the Great Lakes, is lumber; but in lumber transportation Lakes Superior and Huron and Michigan will doubtless never be as important as they have been in the past. The lumber shipped past Sault Ste. Marie decreased 300 million feet; 156 million feet,

* Continued from p. 572 in BULLETIN No. 8, August, 1911.

board measure, from 1897 to 1907 (Fig. 8), and from 1906 to 1907. The relationship of the Glacial Period to the lumber industry in another connection will be discussed below.

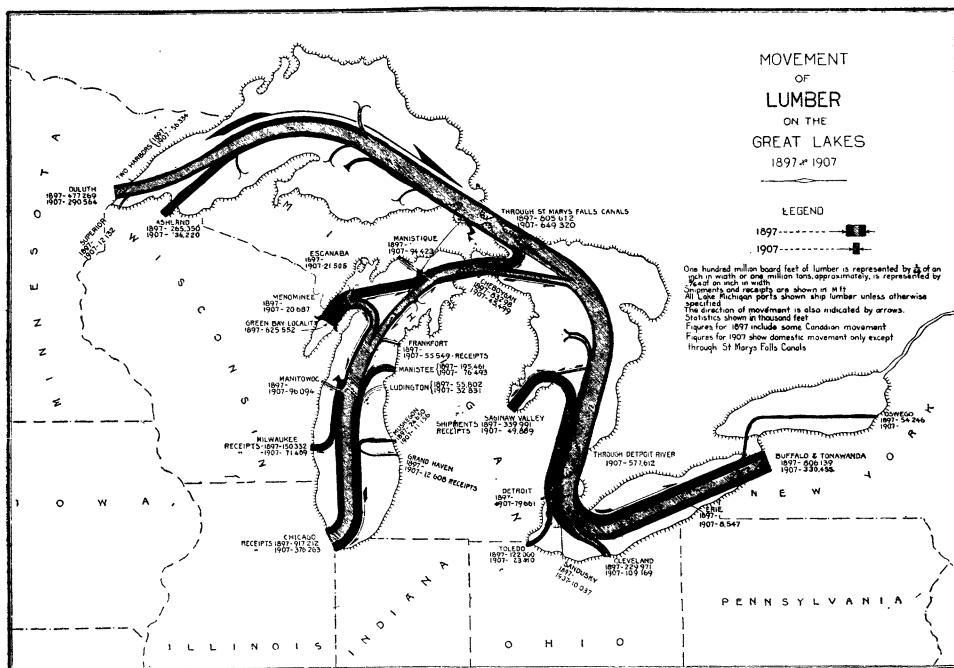


FIG. 8—Decrease in lumber shipments, 1897-1907. (After Commissioner of Corporations.)

INFLUENCE OF LOW GRADES FOR RAILROADS. The relative tonnage shipped from the several Lake Superior ports in iron ore alone, is given in the following table:

IRON ORE SHIPPED IN 1907.	
LAKE PORTS.	LONG TONS.
Duluth-Superior.....	20,886,363
Two Harbors.....	8,188,906
Escanaba	5,761,988
Ashland	3,437,672
Marquette	3,013,826
Total.....	41,288,755 (beside 956,315 tons by rail).

This ore goes largely to Lake Erie ports (Fig. 5), including Tonawanda, Buffalo, Erie, Conneaut, Ashtabula, Fairport, Cleveland, Lorain, Huron, Sandusky and Toledo.

The mines which produce the bulk of the product carried over

the Great Lakes trade route are not on the lake shore, however, and it is accordingly necessary to connect the mines with the nearest harbors by railways. That it has been possible to do this cheaply, and to operate the railroads at moderate expense, is due to the fact that mines, without a single exception, are situated at moderate distances back from the lake shore (Fig. 1), 50 and 80 miles in the case of mines of the Menominee and Crystal Falls districts, whose port is Escanaba; 11 to 14 miles in the case of the mines of the Marquette district, whose port is Marquette; 45 miles in the case of the mines of the Penokee-Gogebic district, whose port is Ashland; 70 to 84 miles in the case of the mines of the Mesabi Range, and 80 to 90 miles in the case of the mines of the Vermilion Range, whose ports are Duluth, Superior and Two Harbors, about 100 miles in the case of the Canadian mines tributary to Fort William and Port Arthur and as yet largely undeveloped, and 12 miles in the case of the mines of the Michipicoten district, whose ore is shipped from Michipicoten Harbor, and smelted at Sault Ste. Marie, Canada. This latter is the only case where steel is produced in the Lake Superior region from the ore which is mined there, although pig iron furnaces run by charcoal have been in operation at Ashland, Marquette, Duluth and many other points in the Lake Superior region from its discovery.

The shipping of the copper ores from the mines of Keweenaw Peninsula, also, has the advantage of having the stamp mills at lake level, and bringing the ore down a gravity road to a place from which the copper can be shipped directly by boat or by railroad.

Thus the heavy iron and the copper ores are always brought down-grade and the empty cars hauls up-grade, which is very much easier than if the loaded cars had to be carried up.

Practically all of the railroads, with the exception of the spur lines which run into the mines, and, therefore, have in some cases rather steep grades for short distances, have been able to construct their lines with a smaller degree of expense than is the case with most railroads going into mineral-producing regions. The railroads of the Rocky Mountains, for example, are obliged to go to great expense to reach the mines, though in the case of railroads reaching many coal fields, the expense of construction is in general rather smaller.

The Canadian Pacific Railway and the Canadian Northern Railway (and the Grand Trunk Pacific, now being constructed), are able to transport their produce from the Canadian wheat fields to Fort William and Port Arthur, the ports on Thunder Bay, Canada, and

the Northern Pacific and Great Northern are able to carry grain from the wheat fields of Minnesota, the Dakotas, and adjacent states to the ports at the head of Lake Superior at comparatively small expense. The railroads which enter the region to carry out the lumber have had a similar history of being able to reach the forests or saw-mills without building unduly expensive lines. The rather low relief to which the country had been worn down is responsible for the fact that so great a number of railways have been able to build their net-work of tracks (Fig. 1) across this comparatively unsettled country, and to compete with one another profitably.

USES OF SWAMP LANDS. The enormous areas of swamp land, where great deposits of peat are found, are due directly to the

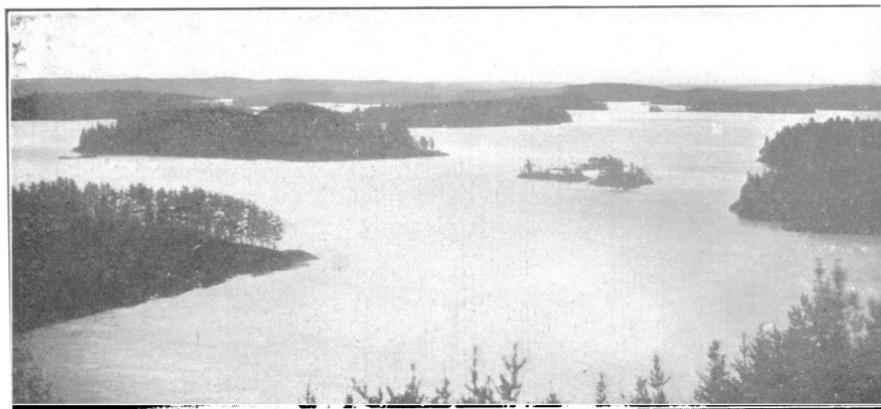


FIG. 9—Lake of the Woods on the International Boundary. Such lakes are a great asset in the lumbering industry.

Glacial Period. Some of these swamp lands, especially in Minnesota, have been recently mapped and studied in view of their potential possibilities as reclaimable farm lands, as sources of permanent water supply, and as producers of peat. C. A. Davis has studied the peat of the upper peninsula of Michigan.* The uses of peat as a fuel, as a fertilizer, in making paper, etc., and in generating illuminating gas are worth considering, but especially the use of peat coke in relation to the iron industry. This latter is already beyond the experimental stage in European countries, where peat coke is much in demand because it has all the advantages of charcoal.

* Geol. Survey of Mich., *Ann. Rept.*, 1906, 183-286.

INFLUENCE OF GLACIATION ON LUMBERING. Reference was made in a preceding paragraph to the influence of the glaciers upon the lumbering industry. Every one conversant with the principles of lumbering can realize what it would mean to the Lake Superior region if there had been no lakes there. Just what the relationship of the amount and kinds of forests to the soil and to the rather sluggish streams produced by the glacial invasion may be, will not be discussed, although it is suggested that the sandy soil which supported such a growth of gigantic pines is a factor in this connection. The principal point to be noted, however, is the fact that if it were not for the great number of regulated streams, the driving of logs to the saw-mills in the spring would not have been possible, and without the innumerable lakes (Fig. 9) the storage of these logs for sawing during the summer would also have been curtailed.

WATER POWER DUE TO GLACIATION. It is probable that before the glacial invasion most of the present waterfalls did not exist. These falls now furnish the water power upon which many of the smaller saw-mills depend. Moreover, the greater amount of water power produced by the diversion of a stream so that it plunges down over the rock ledge which it either did not encounter or had cut away before the Glacial Period, is significant in connection with the growing use of electricity generated by water power which is becoming so prevalent. In the future this natural resource of water power in the Lake Superior region will doubtless be taken advantage of to an even greater extent. Water power on the St. Louis River (Fig. 10), which descends 456 feet in about six miles, now runs an electric plant which lights Duluth, about twenty-five miles away, and runs its street car lines. The project of running the railroad lines, which carry the ores of the Vermilion and the Mesabi Ranges to the shipping points, by electricity generated by the head of water which descends at various points from the highlands north of Duluth to Lake Superior, may even be carried out within a few years. This could be done to equal advantage in the case of several of the other iron ranges. Manufacturing, especially in view of the geographical association of a raw product, like iron, with water power might be a notable future industry of this region, though in the absence of coal it seems unlikely to become a great industry; nor will it ever pay to carry the coal to the ore rather than the ore to the coal, as is done now.

The government, in coöperation with various State bureaus like the Wisconsin and Michigan Geological Surveys, is already investigating the possibilities of water power as a resource of various

parts of this region, especially in Wisconsin,* in Minnesota† and Michigan.‡ They are also studying the relationship of surface water to mining, to agriculture, to health, etc. The use of some of the lakes as sources of water supply for cities, as an ice supply, and as sources of fish, may also be pointed out.

THE FISHING INDUSTRY. In Lake Superior itself, as well as in northern Lake Michigan and western Lake Huron, the fishing industry is of marked importance, giving employment yearly to about 4,000 people and furnishing a considerable food supply to the larger cities and towns and for shipping to regions outside. During 1903 the American portion of Lake Superior and the parts of Lake Michigan and Huron within the area of Fig. 1 yielded 29 million pounds of fish, for which the 2,219 fishermen received \$871,515. The Canadian part of Lake Superior doubtless yielded half as much more.§ The local income from this resource was, therefore, about \$1,250,000 in 1903.

LAKES AS RESORTS. As summer resorts, many of the minor lakes, as well as the Great Lakes themselves, are already taken advantage of, especially in northern Wisconsin and Michigan and Minnesota. They are also visited by numbers of sportsmen, who shoot ducks and other birds about these lakes, and hunt game, notably the moose and deer, in the adjacent forests.

AGRICULTURAL RESOURCES. The valley of the Red River of the North, which lies in the northwestern part of the area, occupies the bed of an extinct glacial lake (Lake Agassiz), and is one of the richest wheat lands in the world. This suggests the possibility that in the future more advantage will be taken of these regions as seats of agriculture. The Bureau of Soils of the United States Department of Agriculture, as well as the State Geological Surveys of Michigan and Wisconsin, and the Agricultural College of the University of Wisconsin and adjacent colleges have been studying

* L. S. Smith: "Water Powers of Northern Wisconsin," *Water Supply and Irrigation Paper* 156, U. S. Geol. Survey, 1906; *Bull. XX*, Wis. Geol. & Nat. Hist. Surv., 1908; Barrows and Horton, *Water Supp. and Irrig. Papers* 156, 206, 1907, 20-26; Horton and Follansbee, same, 207, 1907, 50-65.

† R. B. Dole and F. S. Wesbrook: "The Quality of Surface Waters in Minnesota," *Water Supp. and Irrig. Paper*, 193, U. S. Geol. Surv., 1907; Horton and Follansbee, same, 207, 1907, 39-50.

‡ Frank Leverett: "Flowing Well Districts in the Eastern Part of the Northern Peninsula of Michigan"; A. C. Lane: "Waters of the Upper Peninsula of Michigan," *Water Supply Paper* 160, U. S. Geol. Surv., 1906, 29-53; *Ann. Rept.*, Geol. Surv. of Mich., 1903, 113-167; Barrows and Horton, same, 206, 1906, 17-20, 35; A. C. Lane: "Water Resources of the Lower Peninsula of Michigan," *Water Supply and Irrig. Paper* 30, U. S. Geol. Surv., 1899; and the various earlier bulletins of the same bureau on the progress of stream measurements for different years.

§ "Statistics of the Fisheries of the Great Lakes in 1903," by A. B. Alexander, *Appendix to the Report of the Commiss. of Fisheries to the Secr. of Commerce and Labor for 1904*, Washington, 1905, 643-731.

the soil conditions in the vicinity of the northern lakes, and have already published several maps and reports.* These investigations often lead to the production of more profitable crops than those raised in one place, or in the production of crops where nothing is now raised.

These lands are already being taken advantage of in parts of Minnesota, by European emigrants by whom the vacant lands of northern Minnesota, Wisconsin and upper Michigan are regarded as offering an inviting opportunity. Numbers of inhabitants of northern and western Europe who come to the iron ranges to work in the mines, have already begun to buy cut-over lands from the lumbermen for farms. More than that, great regions which are unfit for agriculture and from which the forests have already been stripped are a possible future timber reserve which will either reproduce the forests which have been cut or burned away, or will be reforested by the people of the United States, whose lumber resources are already within sight of exhaustion. These lands on the watersheds bear an important relationship to the flow of the streams rising there. The State of Wisconsin already has one of the largest State forest reserves near the divide of the Mississippi, Lake Superior and Lake Michigan drainage.

CITIES. As a result of the various sorts of activities in the Lake Superior region, five kinds of settlements have grown up, different in the quality as well as in the length of life promised them. The first resource of this region, the fur trade, resulted in the first type of settlements,† trading posts, such as those of various French and English companies, including the Hudson's Bay Company. These posts have many of them seen their time of prosperity and are now abandoned. Fort Charlotte, Minnesota, on the grand portage, was of this type, as was also Fond du Lac, at the head of navigation on the St. Louis River of Minnesota, which was founded very early by the Hudson's Bay Company, and on whose site a small modern village stands. Nipigon, another Hudson's Bay Company post, still maintains a small trade. On the sites of certain of these fur-trading posts, however, permanent towns have been built for other reasons.

With, and after these, came the second type of settlements, the missions, some of them later becoming forts, like Michilimackinac, L'Arbre Croche, Fort La Baye at Green Bay, the fort at Sault Ste. Marie, etc.

* "Soil Surv. of the Munising Area," Mich., 1905; "Carlton Area," Minn.-Wis., 1906; "Superior Area," Wis., 1925; "Portage County, Wis.," 1906, etc., U. S. Dept. of Agric., Bureau of Soils.

† Even preceding the Jesuit missions. See F. J. Turner, "Character and Influence of the Indian Trade in Wisconsin," Johns Hopkins University Studies, Vol. 9, p. 569.

In connection with the lumber industry, towns of the third type were built at many points, as, for example, at Grand Rapids, Minn., and throughout upper Michigan and Wisconsin and Ontario. Not a few of these towns have also been abandoned, as the reason for which they existed has disappeared with the cutting off of the timber (Fig. 8); but on the sites of some of these towns, also, permanent settlements have been built. The paper mills near Grand Rapids, Minnesota, and the furniture factories at many Wisconsin and Michigan towns came there because of water power and



FIG. 10—St. Louis River, looking North, near Thompson. Rapids now used to generate electricity for long distance transmission.

available lumber and wood pulp. In the lowland, eastern portion of the upper peninsula of Michigan, which Rominger described as an unbroken forest* in 1873, there is almost no forest left, and settlements are sparse. During the cutting of the lumber, a considerable temporary population peopled the region, into which an agricultural population is now slowly going, with the establishment of agricultural centers of population that are replacing the lumber towns.

As a result of the mining industry, the fourth class of towns

* Carl Rominger, Geol. Survey of Mich., I, 1873, Part III, page 8.

were built up. The iron mining towns (Fig. 1) include Tower and Ely in the Vermilion district; Virginia and Hibbing on the Mesabi Range; Brainerd in the Cuyuna district; Hurley, Ironwood and Bessemer in the Penokee-Gogebic district; Ishpeming and Negaunee in the Marquette district; Crystal Falls, Iron River, Florence and Iron Mountain in the Crystal Falls, Iron River and Menominee districts. Copper mining towns are Houghton, Hancock and Calumet on Keweenaw Peninsula. Some of these towns, now flourishing, are destined to disappear, as the ore which determined their location becomes exhausted. As an example of a settlement which was first a fur-trading post and then a lumber town, and still later a mining town, Tower, Minn., may be cited. With the extinction of the fur-bearing animals in large numbers and the diminution of the lumber and the iron ore, Tower has had a decline in recent years, and would probably eventually be abandoned were it not the logical site for a summer resort, and a starting point for camping and hunting expeditions. Its beautiful location on Vermilion Lake, at the beginning of a long canoe route over lakes and streams, probably will insure there always being a town at Tower.

Numerous smaller places which have been centers of population because of the fur, lumber or ore, might be cited. The fur-trading posts, missions and forts are many of them gone, though large cities with other reasons for existence stand on the sites of a few; the lumber towns, as such, are fast going out of existence; and the beginning of the abandonment of some of the mining towns is in sight.

The fifth class of towns in this region are those which owe their location to their being commercial centers, *i. e.* shipping points for ore (Fig. 3), gathering or distributing points for agricultural communities (Fig. 4), manufacturing towns with location determined by raw materials and water power (Figs. 7 and 8), or else places of transfer of goods from railway trains to sailing vessels or steamers, especially iron on its way to coal fields or to markets (Figs. 3, 4, 7 and 8). In this class is a great number of large and prosperous towns, the largest and best in the whole region (Fig. 1). Among these, Duluth, Minn., is easily the leading city, and with its twin city, Superior, Wis., has a population of nearly 119,000, the latter city having a notable ship-building industry and many flour mills. Ashland, with a population of about 14,000; Marquette, with a population of 11,500; Fort William and Port Arthur, together with a population of 7,000; Houghton and Han-

cock, with a joint population of 14,000; Escanaba, with a population of 13,000; Sault Ste. Marie, Mich., and Sault Ste. Marie, Ont., with a joint population of nearly 20,000, are all cities which have other reasons for their existence than the exploitation of the expendable resources like fur, lumber and ore, and which, therefore, promise to continue to be centers of population and to increase in size and in prosperity even after all of the iron and copper ores of the lower grades have been shipped.

Away from Lakes Superior and Michigan are the twin cities of St. Paul and Minneapolis, which together have a population of 516,000, and the smaller cities in Minnesota, Wisconsin and Michigan (Fig. 1), like Winona, Eau Claire, Chippewa Falls, Grand Rapids, Stevens Point, Wausau, Menominee, Marinette, Green Bay, Oshkosh, and many others which at the present time have reasons for existence which are related to other things beside the development of the mineral, forests and agricultural resources of the Lake Superior region, and whose relationships will not, therefore, be discussed in this paper.

THE FUTURE OF THE REGION. It is enough to say that the region under consideration, with a sparse population, of which a large percentage is now concentrated in a comparatively small number of cities and towns in proportion to the very great area, will in the future come to support a population many times as great and probably less centralized. This will doubtless come when the local agricultural lands begin to produce the food of the mining towns. The region east of Marquette, for example, might produce vegetables, fruits and dairy products for that mining center. The foodstuffs used at Marquette are now largely obtained from Chicago, to which they are shipped from some other agricultural district. Eastern Minnesota farms might feed Duluth, Superior, and the iron range towns, instead of having the foodstuffs of these towns largely reshipped from St. Paul and Minneapolis.

In the future, the favorably located places will continue to grow, and the unfavorably located places will decrease in size. The vacant intermediate areas, however, should come to be occupied by larger and more permanent populations of farmers, factory hands, etc., so that the proportion of people living in the cities and towns will probably not continue to be predominant, and the empty areas will gradually be filled up with a population having other pursuits besides those involved in the development of the mineral resources of the region, in which much concentration has already taken place.*

* H. R. Mussey: "Combination in the Mining Industry," *Columbia Univ., Studies in Hist. Econ. and Pub. Law*, XXII, No. 3. 1905, 1-167.

The natives, the fur-traders, the priests, the soldiers, the lumbermen, the fishermen and the miners have opened the region. It remains for agricultural and commercial pursuits to make use of it to its greatest capacity and continue the progressive development and utilization of its resources.

MAPS OF PRIMITIVE PEOPLES*

TRANSLATED FROM THE RUSSIAN AND ABRIDGED BY

H. DE HUTOROWICZ

This quarto volume is a work on the origin and development of the map. A map which N. L. Gondatti brought from the Tchuktchi country, northeast Asia, in the basin of the Anadyr River, suggested the idea of writing it. The author gave special attention to primitive maps when he was studying with Ratzel in Leipzig and also during his cartographic studies. After examining the Tchuktchi map in the Anthropological Museum of the Moscow University, he endeavored to find primitive maps in Berlin, Paris, Rome, Dresden, London and other cities, but found only three maps of the Marshall Islands in the Grassi Museum of Leipzig. In 1907 he found in Stockholm maps by the Greenland Eskimo and then succeeded in procuring for examination the Grösser collection in Berlin. About that time the Khatanga expedition of the Imperial Russian Geographical Society returned with a large collection of maps made by Samoyeds, Tunguses, Yakuts, Dolgans and three maps from the Kolyma R. region now at the Museum of the Imperial Academy of Sciences at St. Petersburg. He also found at this museum Rink's Eskimo map. All this material, together with maps sent by American scientific institutions, completed the collection used in preparing this work. It embraces fifty-five maps from Asia, fifteen from America, three from Africa, forty from Australia and Oceania and two from the East Indies.

Good eyesight and a highly developed gift among primitive peo-

**Izvestia Impieratorskovo Ohshchestva Lubitielei Estiestvoznania, Antropologii i Etnografii, sostoyaschavo pri Impieratorskom Moskovskom Universitetie. Tom CXIX. Trudy Geograficheskovo Otdielienia. Vypusk II. B. F. Adler. Karty Pierobytnykh Narodov. St.-Peterburg, 1910.*

(*Bulletin of the Imperial Society of Students of Natural History, Anthropology and Ethnography, at the Imperial University of Moscow. Tome CXIX. Works of the Geographical Section, Number II. B. F. Adler. Maps of Primitive Peoples. St. Petersburg, 1910. viii and 350 pp.*)